BACKGROUND OF THE INVENTION

The present invention relates to an automatic measuring device for measuring the dimensions of a tool for a machine tool.

Resulting from the availability of a magazine including all of the tools necessary for the machining of a workpiece, fully automated machine tools can be used to carry out the machining of a workpiece, such as, for example, a kitchen or bathroom worktop. However, in order to automatically sequence all of the machining operations, the machine tool must first measure and store the exact dimensions of all of the tools stored in its magazine.

Devices are known for allowing such automatic measurement of the dimensions of each tool which is to be fitted on the machine spindle of the machine tool. To this end, the machine spindle, fitted with a tool, is caused to interact with a device arranged on the machine tool in order to deduce, depending on a measurement system specific to the spindle, the dimensions of the tool.

For example, one such device includes two separate feelers, one of which is axially oriented and one of which is radially oriented. The machine tool, with the tool to be measured in its spindle, first rests the bottom face of the tool on the axial feeler, to measure its length, and then rests the outer face on the radial feeler, to measure its diameter. Such

a measurement device, although accurate, is extremely costly and sensitive to impacts. Furthermore, such a measurement device needs to be situated in a protected location, and needs to be sheltered from machining spray.

Another known device includes a laser beam arranged on the machine. The machine determines and stores the dimensions of the tool when the tool cuts the laser beam with the bottom face or the outer face of the tool, corresponding respectively to a determination of the length and the diameter of the tool. The major disadvantage of such a device is that it is unsuitable for working stone, of which kitchen tops are made, for example, because of the water and mud spray which can divert or obstruct the laser beam.

The object of the present invention is to provide an automatic measuring device for measuring the dimensions of a tool which remedies some or all of the aforementioned disadvantages.

SUMMARY OF THE INVENTION

The present invention relates to an automatic measuring device for measuring the dimensions of a tool for a machine tool. The machine includes a spindle for receiving the tool which is capable of being moved in order to interact with a device for deducing, according to a measuring system specific to the spindle, the dimensions of the tool.

In accordance with the present invention, the device for deducing the dimensions of the tool includes a bar made of a material having highly elastic properties. One end of the bar is fixedly attached to a first yoke attached to a fixed frame and an opposite, free end of the bar is in contact with two detectors placed perpendicular to one another and to a second yoke which is capable of sliding on the flexible bar. A platform on which the tool to be measured is capable of resting overhangs the second yoke.

The bar is advantageously made of an elastic steel and has a square cross-section. The detectors are advantageously micrometric end-of-travel detectors (having a high degree of protection against external attack), one of which is placed vertically in order to determine the length of the tool and the other which is placed horizontally in order to determine the diameter of the tool. Each of the detectors is advantageously connected to a measuring system specific to the positions of the spindle, in this way making it possible to deduce the dimensions of the tool when the detectors break contact with the bar. The platform is advantageously provided with a beveled edge.

These and other features of the present invention will become apparent from the description of an exemplary embodiment which is provided below, with reference to the following drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a perspective view of an automatic measuring device for measuring the dimensions of a tool for a machine tool in accordance with the present invention.

Figures 2 and 3 are elevational views respectively taken along the arrows F1 and F2 of Figure 1, illustrating the measurement of the length of a tool.

Figures 4 and 5 are elevational views similar to Figures 2 and 3, illustrating the machine tool in a position in which the measuring device can deduce the diameter of the tool.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Figures 1 to 5 show an automatic measuring device 1, particularly a digitally controlled device for measuring the dimensions of a cutting tool 2 for a machine tool. The measuring device 1 is preferably positioned, as an example, on the side of the machine's tool magazine.

In accordance with the present invention, the measuring device 1 includes a bar 3 made of a material having highly elastic properties. One end of the bar 3 is fixedly attached to a yoke 4, which is in turn attached to a fixed frame 5. An opposite, free end of the bar 3 is in contact with two detectors 6 and 7 placed perpendicular to one another and a yoke 8 capable

of sliding on the flexible bar 3. A platform 9 overhangs the yoke 8 so that the tool 2 to be measured, which is mounted on a spindle 10 of the machine tool, is capable of resting on the platform 9. The bar 3 is advantageously made of an elastic steel and has a square cross-section, allowing good contact with the detectors 6 and 7, as explained below.

In a preferred embodiment, the platform 9 is provided with a beveled edge 11, as is best shown in Figures 2 and 4, to ensure an appropriate measurement of diameter for tools 2 having various shapes, such as, for example, the external concave profile shown in Figures 4 and 5.

The detectors 6 and 7 are advantageously micrometric end-of-travel detectors, one of which (the detector 6) is placed vertically in order to determine the length of a tool, and the other (the detector 7) which is placed horizontally in order to determine the diameter of the tool, as will be explained in greater detail below. As is shown in Figures 2 and 4, the detectors 6 and 7 are attached to a flange 12 that is generally L-shaped, and which is fixedly attached to the frame 5 to ensure contact with the bar 3 only at the ends of the detectors. Each of the detectors 6 and 7 is suitably connected to a conventional system (M) for measuring positions of the spindle 10, in this way making it possible to deduce the dimensions of the tool 2 when the detectors 6 and 7 break contact with the bar 3.

It can be easily understood that in order to measure

the length of a tool 2, it is sufficient for the machine, having the tool in its spindle 10, to cause the bottom face of the tool 2 to rest on the top face of the platform 9 of the yoke 8. This then causes the bar 3 to flex, which releases the vertical end-of-travel detector 6 in order to deduce and register the length of the tool 2 according to the reference positions of the spindle 10. In similar manner, the external diameter of the tool 2 is measured by placing the outside of the tool 2 in contact with the bevel 11 of the platform 9, causing a lateral flexing of the bar 3 and releasing the horizontal end-of-travel detector 7 in order to deduce the diameter of the tool 2.

It will be noted that the precision of the measurement can be optimized by moving the movable yoke 8 associated with the platform 9, and distancing the movable yoke 8 as far as possible from the free end of the bar 3, where the detectors 6 and 7 are situated. The greater the amplitude of the bar 3, the more precise the measurement.

The automatic measuring device 1 has the following advantages. The measuring device is not fragile, unlike prior measuring devices, and operates irrespective of the environment (i.e., that is wet or dusty). The measuring device is economical to purchase and maintain, and is reliable due to the simplicity of its design and the components used. Furthermore, in the event of an error by the operator or the machine, only the bar can be damaged, which is easily and rapidly replaceable, and at less

cost.

Although the present invention has been described with reference to a particular embodiment, it is to be understood that the present invention covers all of the technical equivalents of the methods described.